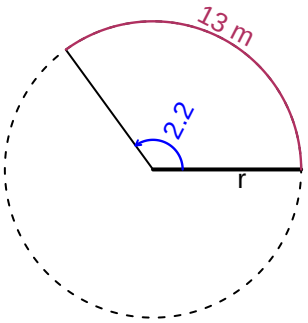
Name: Date:

Trig Final (SLTN v688)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 2.2 radians. The arc length is 13 meters. How long is the radius in meters?

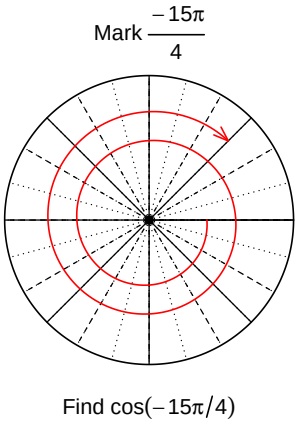


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

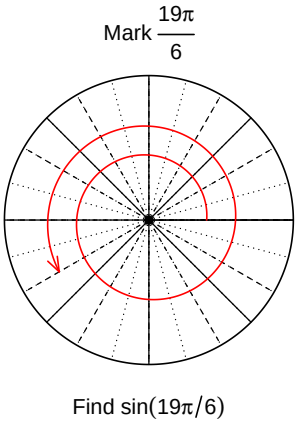
$r = 5.909$ meters.

Question 2

Consider angles $\frac{-15\pi}{4}$ and $\frac{19\pi}{6}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{-15\pi}{4}\right)$ and $\sin\left(\frac{19\pi}{6}\right)$ by using a unit circle (provided separately).



Find $\cos(-15\pi/4)$



Find $\sin(19\pi/6)$

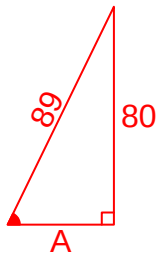
$\cos(-15\pi/4) = \frac{\sqrt{2}}{2}$

$\sin(19\pi/6) = \frac{-1}{2}$

Question 3

If $\sin(\theta) = \frac{-80}{89}$, and θ is in quadrant III, determine an exact value for $\tan(\theta)$.

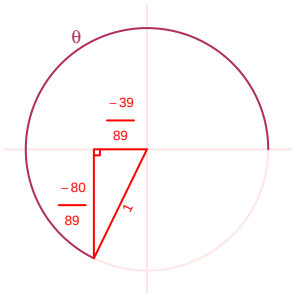
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$A^2 + 80^2 = 89^2$$
$$A = \sqrt{89^2 - 80^2}$$
$$A = 39$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant III in a unit circle.



$$\tan(\theta) = \frac{\frac{-80}{89}}{\frac{-39}{89}} = \frac{80}{39}$$

Question 4

A mass-spring system oscillates vertically with a midline at $y = -8.11$ meters, an amplitude of 4.26 meters, and a frequency of 6.95 Hz. At $t = 0$, the mass is at the minimum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -4.26\cos(2\pi 6.95t) - 8.11$$

or

$$y = -4.26\cos(13.9\pi t) - 8.11$$

or

$$y = -4.26\cos(43.67t) - 8.11$$